

**Progress Report  
February 2003**

**FHWA POOLED-FUND PROJECT NUMBER: TPF5-(003)**

**TITLE:** Extending the Season for Concrete Construction and Repair

**PRINCIPAL INVESTIGATOR:**

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**OBJECTIVE:** To develop an antifreeze admixture that conform to existing industry standards. This work will adapt recently developed knowledge about off-the-shelf admixtures to the specific conditions of highway construction. The admixture will protect concrete to 23°F (-5°C) or lower and allow concrete to gain appreciable strength while at that temperature.

**REPORTING PERIOD:** 1 September 2002 through 1 February 2003

**ITEMS IN THIS ISSUE:**

- Funding
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**Funding:** As of this writing, the funding for the final year of this project has not begun to filter into FHWA. This is a bit unusual as last year's funding began moving around the October time-frame. We are assuming at this point that the slowness of this year's Congress in coming up with a budget has much to do with this funding delay. Please let us know if that is not the case.

**ASTM:** CRREL presented an overview of antifreeze admixture research to the American Society for Testing and Materials (ASTM) Committee on Concrete and Concrete Aggregates (C09), Subcommittee on Chemical Admixtures (C09.23.03) on 9 and 10 December 2002. Among other antifreeze studies that CRREL has accomplished in the past, the ASTM gathering was most interested in our pooled-fund study and the fact that we are coming up with field deployable results. As a result of this presentation, CRREL has been asked to draft an ASTM standard for the use of admixtures to lower the freezing point of concrete mixes. This draft will be presented to ASTM in June 2003. This is good news for the industry.

Although great strides have been made since last fall, the adoption of a standard for antifreeze admixtures is not likely to happen soon; we've been told that it may take years. Therefore we've decided to focus on off-the-shelf admixtures so we will be able to move ahead with this technology later this year without waiting for a new standard or new admixtures to be developed.

**Recent results:** Two field trials were conducted in New Hampshire using a suite of admixtures from Master Builders. This completes our goal of developing and field-testing antifreeze admixture formulations from two manufacturer's product lines. Our first field trial this year was conducted on 12 December in the White Mountains of New Hampshire. We experienced working with a new ready-mix company and with a new admixture dosing technique -- i.e., batching all admixtures at the construction site. The ready-mix plant was located about 15 miles away from the job site, causing a long enough travel time to have caused difficulties with slump loss. By batching only the main concrete ingredients at the plant, without the admixtures, the problem of rapid slump loss was avoided.

The second job was conducted during the following week on 18 December near CRREL and provided us with experience in handling back-to-back jobs. Although the ready-mix plant was located only 1 mile from the job site, we experimented with pumping the final admixture on top of the concrete just before the truck left the plant. This last admixture was not mixed into the concrete until the truck arrived at the construction site. This appears to be the most promising way to extend haul time and to assure that the concrete remains workable for reasonably long periods. Up to this point, we figured our concrete mixtures would retain workability for up to 45 minutes following mixing, so travel time would dictate how quickly the concrete would have to be placed and finished. However, with the final mixing taking place at the construction site, it is possible to have the full 45 minutes to work with the concrete. Reports from each field trial can be viewed at:

[http://www.crrel.usace.army.mil/concrete/State\\_Demonstrations.htm](http://www.crrel.usace.army.mil/concrete/State_Demonstrations.htm)

**Looking ahead:** As part of our technology transfer effort, we plan to conduct one more field test. This time we would like to have one of our partners use this technology. The plan is to have a state DOT order the concrete and have the admixtures dosed either at the plant or at the job, and then place, consolidate, finish and cure the concrete.

NHDOT has volunteered to test this process for us on 13 February 2003. The antifreeze concrete poured will become part of a larger research project being conducted by NHDOT to determine which product or products currently on the market are most appropriate for sidewalk curb-ramp application. As many as eight different products designed to assist the visually impaired will be tested to determine how they perform in the winter. Our concrete will become the base upon which these products will be tested. Concord, N.H. will serve as the test site.

**Final report and workshop:** Next, we plan to complete our laboratory studies and draft a final report. Part of this report, besides explaining what happened in this project, will develop a users guide for antifreeze admixtures and cold-weather concrete. We envision this guide to be a practical how-to manual and we will look to you to help us make this a useful product.

And finally, we would like to conduct a workshop to explain this project, its findings, and our recommendations. We are not sure of the best approach: hold one workshop at CRREL, hold regional workshops, or hold individual state workshops. The timing of the workshop(s) would probably be late summer to early fall. **Let us know what works best for you?**

**Phase II:** -In January 2003, we e-mailed a draft proposal seeking input on our suggestions for follow-on studies. Our current project has developed a new cold-weather concreting technology that will be delivered to you on time, and we see distinct possibilities for other high pay-off ventures. In our recent mailing, we identified four possible studies, knowing that it was not possible to conduct all at the same time, but giving you the chance to pick what you liked (we figure that we could conduct up to two of the four studies in the next phase).

Feedback to date suggests that the study aimed at enhancing the service life of concrete is a top priority. For this topic, preliminary findings suggest service life may be significantly increased, perhaps up to twice as long, which represents a huge reduction in future maintenance costs. Based on this input, we will refocus our proposal to include only the durability issue, providing more detail of our research plan and cost estimates, and send it out again for your consideration and approval. We are still open to comments. The next draft will go out toward the end of February. Thank you all for helping to shape this study. We look forward to working with you in Phase II.

At this point we are not sure if Phase II can be considered to be part of Phase I for funding considerations or if Phase II will require a new SP&R number. However, as was the case with Phase I, we will need at least three states to commit before we can get the ball rolling.

***What we need from you:***

1. Give us your thoughts on whether a workshop is a good idea, and, if so, when and where it should be held.
2. Let us know if you have further comments on the January Phase II proposal. We plan to use your comments to shape our next draft, which, as it now stands, focuses only on durability.
3. Let us we hear from you on the above two items before the end of February 2003.